

Art Unit: N/A

This listing of claims will replace all prior versions, and listings, of claims in the application:

5 **Listing of Claims:**

1-2. (canceled)

3. (original) A centrifugal separator (10, 10A, 10B) which comprises a screw conveyor (40) inside of a bowl (20), supports them so as to be relatively rotatable, separates the object to be treated from a feed stock supplied to the inside of said bowl (20), and carries out cleaning and deliquidization of said object to be treated with a screen part (30) provided along the inner circumferential surface at one end of the bowl (20), a hub (41) of said screw conveyor (40) having a cleaning liquid receiving part (43) for receiving the cleaning liquid supplied to the inside of the hub (41) and a cleaning nozzle (45) which jet spouts the cleaning liquid from the inside of the cleaning liquid receiving part (43) toward said screen part (30), wherein

a liquid conduction part for jet spouting at least a part of the cleaning liquid directly toward the residual layer crystals formed in the clearance between the outer circumferential edge of the flight (42) of said screw conveyor (40) and the inner circumferential surface of said screen part (30) is provided; and

the tip of at least a part of the cleaning liquid conduction part is located within 10 mm from the inner surface of the screen part (30).

4. (original) A centrifugal separator (10, 10A, 10B) which comprises a screw conveyor (40) inside of a bowl

Art Unit: N/A

(20), supports them so as to be relatively rotatable, separates the object to be treated from a feed stock supplied to the inside of said bowl (20), and carries out cleaning and deliquidization of said object to be treated with a screen part (30) provided along the inner circumferential surface at one end of the bowl (20), a hub (41) of said screw conveyor (40) having a cleaning liquid receiving part (43) for receiving the cleaning liquid supplied to the inside of the hub (41) and a cleaning nozzle (45) which jet spouts the cleaning liquid from the inside of the cleaning liquid receiving part (43) toward said screen part (30), wherein

a residual layer crystal cleaning liquid receiving part (46) for receiving the cleaning liquid for cleaning the residual layer object to be treated formed in the clearance between the outer circumferential edge of the flight (42) of said screw conveyor (40) and the inner circumferential surface of said screen part (30) is provided inside of said cleaning liquid receiving part (43), being partitioned independently of the inside of said cleaning liquid receiving part (43); and

a residual layer crystal cleaning liquid path is formed along the direction of the helix of said flight (42) for causing the cleaning liquid inside of said residual layer crystal cleaning liquid receiving part (46) to be directly jet spouted toward said residual layer object to be treated from the outer circumferential edge of said flight (42), with no relation to said cleaning liquid receiving part (43).

5. (original) A centrifugal separator (10, 10A) which comprises a screw conveyor (40) inside of a bowl (20), supports them so as to be relatively rotatable, separates

Art Unit: N/A

the object to be treated from a feed stock supplied to the inside of said bowl (20), and carries out cleaning and deliquidization of said object to be treated with a screen part (30) provided along the inner circumferential surface at one end of the bowl (20), a hub (41) of said screw conveyor (40) having a cleaning liquid receiving part (43) for receiving the cleaning liquid supplied to the inside of the hub (41) and a cleaning nozzle (45) which jet spouts the cleaning liquid from the inside of the cleaning liquid receiving part (43) toward said screen part (30), wherein a residual layer crystal cleaning liquid receiving part (46) for receiving the cleaning liquid for cleaning the residual layer object to be treated formed in the clearance between the outer circumferential edge of the flight (42) of said screw conveyor (40) and the inner circumferential surface of said screen part (30) is provided inside of said cleaning liquid receiving part (43), being partitioned independently of the inside of said cleaning liquid receiving part (43);

in the locations where the inner circumferential edges of said flight (42) range, a connection tube (47) is provided at prescribed intervals along the direction of the helix of the flight (42) on the bottom side of said residual layer crystal cleaning liquid receiving part (46), and a cleaning liquid discharge hole (49) which connect to said connection tube (47), being radially extended from the inner circumferential surface side of the hub (41) to the outer circumferential edge of the flight (42) inside the wall of the hub (41) or the flight (42) of said screw conveyor (40), is provided; and

the cleaning liquid inside of said residual layer crystal cleaning liquid receiving part (46) is directly jet

Art Unit: N/A

spouted toward said residual layer object to be treated from the tip opening of said respective cleaning liquid discharge holes (49) which are opened at the outer circumferential edge of said flight (42).

5                   6. (original) A centrifugal separator (10B) which comprises a screw conveyor (40) inside of a bowl (20), supports them so as to be relatively rotatable, separates the object to be treated from a feed stock supplied to the inside of said bowl (20), and carries out cleaning and  
10 deliquidization of said object to be treated with a screen part (30) provided along the inner circumferential surface at one end of the bowl (20), a hub (41) of said screw conveyor (40) having a cleaning liquid receiving part (43) for receiving the cleaning liquid supplied to the inside of  
15 the hub (41) and a cleaning nozzle (45) which jet spouts the cleaning liquid from the inside of the cleaning liquid receiving part (43) toward said screen part (30), wherein  
a residual layer crystal cleaning liquid receiving part (46) for receiving the cleaning liquid for  
20 cleaning the residual layer object to be treated formed in the clearance between the outer circumferential edge of the flight (42) of said screw conveyor (40) and the inner circumferential surface of said screen part (30) is provided inside of said cleaning liquid receiving part (43),  
25 being partitioned independently of the inside of said cleaning liquid receiving part (43);

in the locations adjacent to the surface (42b) on the side opposite to the object-to-be-treated conveying surface (42a) of said flight (42), a connection tube (47)  
30 is provided at prescribed intervals along the direction of the helix of said flight (42) on the bottom side of said residual layer crystal cleaning liquid receiving part (46),

Art Unit: N/A

and in the hub (41) of said screw conveyor (40), a cleaning liquid connection hole (48) to which said connection tube (47) is connected is provided;

on the surface (42b) on the side opposite to the  
5 object-to-be-treated conveying surface (42a) of said flight (42), a cleaning liquid discharge pipe (80) which is connected to said cleaning liquid connection hole (48), extending in the radial direction from the inner circumferential edge to the outer circumferential edge of  
10 the flight (42), is mounted at prescribed intervals along the direction of the helix of the flight (42); and

the cleaning liquid inside of said residual layer  
crystal cleaning liquid receiving part (46) is directly jet  
spouted toward said residual layer object to be treated  
15 from the tip opening of said cleaning liquid discharge pipe (80).

7. (original) The centrifugal separator (10A) of  
claim 5, wherein, in the tip surface of the outer  
circumferential edge of said flight (42), a channel (49a)  
20 which consecutively extends along the direction of the helix of the flight (42), and to which the tip opening of said respective cleaning liquid discharge holes (49) is connected is formed.

8. (currently amended) The centrifugal separator  
25 (10, 10A, 10B) of claim 4, ~~claim 5, claim 6, or claim 7,~~  
wherein, into the inside of the hub (41) of said screw conveyor (40), a feed tube (60) for supplying the feed stock that extends in the axial direction of the hub (41) is inserted;

30 a cleaning liquid supply path (71) for supplying the cleaning liquid to the inside of said cleaning liquid receiving part (43) is formed inside of said feed tube (60),

Art Unit: N/A

and at intermediate points on the feed tube (60) that are opposed to said cleaning liquid receiving part (43) in the radial direction, openings of said cleaning liquid supply path (71) are provided; and

5           a residual layer crystal cleaning liquid supply path (72) for supplying the cleaning liquid to the inside of said residual layer crystal cleaning liquid receiving part (46) is formed inside of said feed tube (60), and at intermediate points on the feed tube (60) that are opposed  
10 to said residual layer crystal cleaning liquid receiving part (46) in the radial direction, openings of said residual layer crystal cleaning liquid supply path (72) are provided.

9. (original) A centrifugal separator (10, 10C)  
15 which comprises a screw conveyor (40) inside of a bowl (20), supports them so as to be relatively rotatable, separates the object to be treated from a feed stock supplied to the inside of said bowl (20), and carries out cleaning and deliquidization of said object to be treated with a screen  
20 part (30) provided along the inner circumferential surface at one end of the bowl (20), a hub (41) of said screw conveyor (40) having a cleaning liquid receiving part (43) for receiving the cleaning liquid supplied to the inside of the hub (41) and a cleaning nozzle (45) which jet spouts  
25 the cleaning liquid from the inside of the cleaning liquid receiving part (43) toward said screen part (30), wherein  
inside of said cleaning liquid receiving part (43), a plurality of residual layer crystal cleaning liquid discharge holes (52) which are arranged at prescribed  
30 intervals along the direction of the helix of said flight (42) in the locations adjacent to the surface (42b) on the side opposite to the object-to-be-treated conveying surface

Art Unit: N/A

(42a) of the flight (42) of said screw conveyor (40) is provided;

along the outer circumferential edge of the surface (42b) on the side opposite to the object-to-be-treated conveying surface (42a) of said flight (42), a  
5 cover flight (50) with a small width that extends in the direction of the helix of the flight (42) is mounted with a prescribed spacing being given with respect to the surface (42b) on the side opposite to the object-to-be-treated  
10 conveying surface (42a); and

the cleaning liquid inside of said cleaning liquid receiving part (43) that springs out from said residual layer crystal cleaning liquid discharge holes (52) is directly jet spouted toward the residual layer object to  
15 be treated formed in the clearance between the outer circumferential edge of said flight (42) and the inner circumferential surface of said screen part (30) through the clearance between the outer circumferential edge of said flight (42) and said cover flight (50).

20 10. (original) The centrifugal separator (10C) of claim 9, wherein said cleaning liquid receiving part (43) is provided with a partition plate (43a) which partitions the inside of the cleaning liquid receiving part (43) into two or more in the axial direction in the screen  
25 part (30) of said bowl (20) for allowing a particular cleaning range in said screen part (30) to be selected.

11. (original) A centrifugal separator (10D) which comprises a screw conveyor (40) inside of a bowl (20), supports them so as to be relatively rotatable, separates  
30 the object to be treated from a feed stock supplied to the inside of said bowl (20), and carries out cleaning and deliquidization of said object to be treated with a screen

Art Unit: N/A

part (30) provided along the inner circumferential surface at one end of the bowl (20), a hub (41) of said screw conveyor (40) having a cleaning liquid receiving part (43) for receiving the cleaning liquid supplied to the inside of the hub (41) and a cleaning nozzle (45) which jet spouts the cleaning liquid from the inside of the cleaning liquid receiving part (43) toward said screen part (30), wherein a residual layer crystal cleaning liquid receiving part (46) for receiving the cleaning liquid for cleaning the residual layer object to be treated formed in the clearance between the outer circumferential edge of the flight (42) of said screw conveyor (40) and the inner circumferential surface of said screen part (30) is provided inside of said cleaning liquid receiving part (43), being partitioned independently of the inside of said cleaning liquid receiving part (43);

inside of the locations adjacent to the surface (42b) on the side opposite to the object-to-be-treated conveying surface (42a) of said flight (42), a plurality of connection tubes (47) are provided at prescribed intervals along the direction of the helix of said flight (42) on the bottom side of said residual layer crystal cleaning liquid receiving part (46), and in the hub (41) of said screw conveyor (40), a plurality of residual layer crystal cleaning liquid discharge holes (52) to which said respective connection tubes (47) are connected, respectively, are provided;

along the outer circumferential edge of the surface (42b) on the side opposite to the object-to-be-treated conveying surface (42a) of said flight (42), a cover flight (50) with a small width that extends in the direction of the helix of the flight (42) is mounted with a



Art Unit: N/A

prescribed spacing being given with respect to the surface (42b) on the side opposite to the object-to-be-treated conveying surface (42a); and

the cleaning liquid inside of said residual layer  
5 crystal cleaning liquid receiving part (46) that springs out from said respective residual layer crystal cleaning liquid discharge holes (52) is directly jet spouted toward said residual layer object to be treated through the clearance between the outer circumferential edge of said  
10 flight (42) and said cover flight (50).

12. (original) The centrifugal separator (10D) of claim 11, wherein, into the inside of the hub (41) of said screw conveyor (40), a feed tube (60) for supplying the feed stock that extends in the axial direction of the  
15 hub (41) is inserted;

a cleaning liquid supply path (71) for supplying the cleaning liquid to the inside of said cleaning liquid receiving part (43) is formed inside of said feed tube (60), and at intermediate points on the feed tube (60) that are  
20 opposed to said cleaning liquid receiving part (43) in the radial direction, openings of said cleaning liquid supply path (71) are provided; and

a residual layer crystal cleaning liquid supply path (72) for supplying the cleaning liquid to the inside  
25 of said residual layer crystal cleaning liquid receiving part (46) is formed inside of said feed tube (60), and at intermediate points on the feed tube (60) that are opposed to said residual layer crystal cleaning liquid receiving part (46) in the radial direction, openings of said  
30 residual layer crystal cleaning liquid supply path (72) are provided.

Art Unit: N/A

13. (original) A centrifugal separator (10E) which comprises a screw conveyor (40) inside of a bowl (20), supports them so as to be relatively rotatable, separates the object to be treated from a feed stock supplied to the inside of said bowl (20), and carries out cleaning and deliquidization of said object to be treated with a screen part (30) provided along the inner circumferential surface at one end of the bowl (20), a hub (41) of said screw conveyor (40) having a cleaning liquid receiving part (43) for receiving the cleaning liquid supplied to the inside of the hub (41) and a cleaning nozzle (45) which jet spouts the cleaning liquid from the inside of the cleaning liquid receiving part (43) toward said screen part (30), wherein inside of the hub (41) of said screw conveyor (40) on one side thereof, a residual layer crystal cleaning liquid receiving chamber (54) which receives the cleaning liquid for cleaning said residual layer object to be treated formed in the clearance between the outer circumferential edge of the flight (42) of the screw conveyor (40) and the inner circumferential surface of said screen part (30) is provided, being partitioned independently of said cleaning liquid receiving part (43); on the outer circumference of the hub (41) of said screw conveyor (40), a plurality of residual layer crystal cleaning liquid introducing tubes (53) are arranged at prescribed intervals in the circumferential direction of the hub (41), being extended along the axial direction of the hub (41) so as to penetrate through said flight (42), respectively, with one end of the respective residual layer crystal cleaning liquid introducing tubes (53) being connected to the inside of said residual layer crystal cleaning liquid receiving chamber (54);

Art Unit: N/A

at intermediate points on said respective residual layer crystal cleaning liquid introducing tubes (53), a plurality of residual layer crystal cleaning liquid discharge holes (53a) which are arranged at prescribed intervals along the direction of the helix of the flight (42) of said screw conveyor (40) in the locations adjacent to the surface (42b) on the side opposite to the object-to-be-treated conveying surface (42a) of said flight (42) are provided;

along the outer circumferential edge of the surface (42b) on the side opposite to the object-to-be-treated conveying surface (42a) of said flight (42), a cover flight (50) with a small width that extends in the direction of the helix of the flight (42) is mounted with a prescribed spacing being given with respect to the surface (42b) on the side opposite to the object-to-be-treated conveying surface (42a); and

the cleaning liquid which has been introduced into said respective residual layer crystal cleaning liquid introducing tubes (53) from said residual layer crystal cleaning liquid receiving chamber (54) and which springs out through said respective residual layer crystal cleaning liquid discharge holes (53a) is directly jet spouted toward said residual layer object to be treated through the clearance between the outer circumferential edge of said flight (42) and said cover flight (50).

14. (currently amended) The centrifugal separator (10, 10C, 10D, 10E) of claim 9, ~~claim 10, claim 11, claim 12, or claim 13,~~ wherein said cover flight (50) is mounted, being provided with a slope with respect to the surface (42b) on the side opposite to the object-to-be-treated conveying surface (42a) of said flight (42) such

Art Unit: N/A

that the clearance is gradually narrowed down from the side closer to said hub (41) to the side closer to the outer circumferential edge of the flight (42), and is mounted through supporting plates (51) which are arranged at  
5 prescribed intervals.

15. (new) The centrifugal separator (10, 10A, 10B) of claim 5, wherein, into the inside of the hub (41) of said screw conveyor (40), a feed tube (60) for supplying the feed stock that extends in the axial direction of the  
10 hub (41) is inserted;

a cleaning liquid supply path (71) for supplying the cleaning liquid to the inside of said cleaning liquid receiving part (43) is formed inside of said feed tube (60), and at intermediate points on the feed tube (60) that are  
15 opposed to said cleaning liquid receiving part (43) in the radial direction, openings of said cleaning liquid supply path (71) are provided; and

a residual layer crystal cleaning liquid supply path (72) for supplying the cleaning liquid to the inside  
20 of said residual layer crystal cleaning liquid receiving part (46) is formed inside of said feed tube (60), and at intermediate points on the feed tube (60) that are opposed to said residual layer crystal cleaning liquid receiving part (46) in the radial direction, openings of said  
25 residual layer crystal cleaning liquid supply path (72) are provided.

16. (new) The centrifugal separator (10, 10A, 10B) of claim 6, wherein, into the inside of the hub (41) of said screw conveyor (40), a feed tube (60) for supplying  
30 the feed stock that extends in the axial direction of the hub (41) is inserted;

Art Unit: N/A

a cleaning liquid supply path (71) for supplying the cleaning liquid to the inside of said cleaning liquid receiving part (43) is formed inside of said feed tube (60), and at intermediate points on the feed tube (60) that are  
5 opposed to said cleaning liquid receiving part (43) in the radial direction, openings of said cleaning liquid supply path (71) are provided; and

a residual layer crystal cleaning liquid supply path (72) for supplying the cleaning liquid to the inside  
10 of said residual layer crystal cleaning liquid receiving part (46) is formed inside of said feed tube (60), and at intermediate points on the feed tube (60) that are opposed to said residual layer crystal cleaning liquid receiving part (46) in the radial direction, openings of said  
15 residual layer crystal cleaning liquid supply path (72) are provided.

17. (new) The centrifugal separator (10, 10A, 10B) of claim 7, wherein, into the inside of the hub (41) of said screw conveyor (40), a feed tube (60) for supplying  
20 the feed stock that extends in the axial direction of the hub (41) is inserted;

a cleaning liquid supply path (71) for supplying the cleaning liquid to the inside of said cleaning liquid receiving part (43) is formed inside of said feed tube (60),  
25 and at intermediate points on the feed tube (60) that are opposed to said cleaning liquid receiving part (43) in the radial direction, openings of said cleaning liquid supply path (71) are provided; and

a residual layer crystal cleaning liquid supply  
30 path (72) for supplying the cleaning liquid to the inside of said residual layer crystal cleaning liquid receiving part (46) is formed inside of said feed tube (60), and at

Art Unit: N/A

intermediate points on the feed tube (60) that are opposed to said residual layer crystal cleaning liquid receiving part (46) in the radial direction, openings of said residual layer crystal cleaning liquid supply path (72) are  
5 provided.

18. (new) The centrifugal separator (10, 10C, 10D, 10E) of claim 10, wherein said cover flight (50) is mounted, being provided with a slope with respect to the surface (42b) on the side opposite to the object-to-be-  
10 treated conveying surface (42a) of said flight (42) such that the clearance is gradually narrowed down from the side closer to said hub (41) to the side closer to the outer circumferential edge of the flight (42), and is mounted through supporting plates (51) which are arranged at  
15 prescribed intervals.

19. (new) The centrifugal separator (10, 10C, 10D, 10E) of claim 11, wherein said cover flight (50) is mounted, being provided with a slope with respect to the surface (42b) on the side opposite to the object-to-be-  
20 treated conveying surface (42a) of said flight (42) such that the clearance is gradually narrowed down from the side closer to said hub (41) to the side closer to the outer circumferential edge of the flight (42), and is mounted through supporting plates (51) which are arranged at  
25 prescribed intervals.

20. (new) The centrifugal separator (10, 10C, 10D, 10E) of claim 12, wherein said cover flight (50) is mounted, being provided with a slope with respect to the surface (42b) on the side opposite to the object-to-be-  
30 treated conveying surface (42a) of said flight (42) such that the clearance is gradually narrowed down from the side closer to said hub (41) to the side closer to the outer

Art Unit: N/A

circumferential edge of the flight (42), and is mounted through supporting plates (51) which are arranged at prescribed intervals.

21. (new) The centrifugal separator (10, 10C, 5 10D, 10E) of claim 13, wherein said cover flight (50) is mounted, being provided with a slope with respect to the surface (42b) on the side opposite to the object-to-be-treated conveying surface (42a) of said flight (42) such that the clearance is gradually narrowed down from the side 10 closer to said hub (41) to the side closer to the outer circumferential edge of the flight (42), and is mounted through supporting plates (51) which are arranged at prescribed intervals.